ABSTRACT

Heart disease is the leading cause of death globally. In Indonesia, approximately 1,017,290 people suffer from heart disease. Arrhythmia is one of the common heart disorders caused by abnormalities in the conduction of electrical impulses to the myocardium. Broadly, arrhythmias are divided into two main groups: bradyarrhythmia, characterized by a heart rate that is too slow (less than 60 beats per minute), and tachyarrhythmia, characterized by a heart rate that is too fast (more than 100 beats per minute).

Currently, heart examinations are generally conducted in hospitals by visiting cardiologists and must be performed by qualified medical personnel. This process can be time-consuming and costly, especially since Heart Rate Variability (HRV) monitoring can only be performed during the examination. HRV refers to the variation in the time intervals between consecutive heartbeats, representing small fluctuations in the amount of time between each heartbeat, where the difference may add or subtract a fraction of a second between beats.

With the introduction of the Real-time Heart Rate Variability Monitor, which is capable of classifying heartbeats as regular or irregular using time domain analysis such as Mean Pulse Interval (MPI), Standard Deviation of Pulse Interval (SDPI), Root Mean Square of Successive Differences (RMSSD), pNN50, and beats per minute (BPM), the device leverages machine learning with the Random Forest Classifier algorithm, achieving an accuracy rate of up to 89%. The device's screen displays the heart rate status as "regular" or "irregular" along with the BPM value. Additionally, the device is connected to a mobile application, allowing real-time heart rate monitoring. This innovation is expected to provide an accurate, practical, and affordable solution for daily arrhythmia monitoring.

Keywords: Heart Disease, Arrhythmia, Heart Rate Variability (HRV), Machine Learning, Random Forest Classifier, Time Domain Analysis, Real-time Monitoring